SOUTHWEST FISHERIES SCIENCE CENTER
FIRST QUARTER REPORT - FY 2005
(For the period 1 October 2004 through 31 December 2004)

LA JOLLA LABORATORY) ANTARCTIC ECOSYSTEM RESEARCH DIVISION

Submitted by: Rennie Holt, Director, Antarctic Ecosystem Research Division.

Title of Accomplishment or Milestone: Provide scientific advice to the Convention for Antarctic Marine Living Resources (CCAMLR) Scientific Committee and Commission during meetings in Hobart, Australia, in October 2004.

Current Status: During the meetings (25-29 October 2004), quotas were set for Antarctic finfish, krill, crab and squid fisheries. Other topics discussed included marine debris, bycatch mortality, illegal fishing and new and exploratory fisheries. This year's meetings also established a fishery plan for the fisheries in the Convention Area.

Background Information: Each year, the CCAMLR Scientific Committee meets prior to the meeting of the Commission. The Committee reviews research results presented by CCAMLR members to make recommendations to the Commission regarding each fishery occurring in Antarctic waters. These include advice regarding catch levels by area, total allowable catch, closed seasons and areas, bycatch regulations and seabird mortality. This advice is used by the Commission to set regulations for the next season.

Purpose of Activity: The purpose of the CCAMLR is to develop management strategies agreed by all members that will allow for the sustained harvesting of marine living resources in the Southern Ocean using an ecosystem approach. The Commission not only is interested with levels of harvest that might be taken but also the effect of harvesting on dependent and related species. Much of the research conducted by CCAMLR members includes monitoring of predator species that feed upon krill and other prey.

Description of Accomplishment and Significant Results: During the 2003/04 season, 14 CCAMLR members had actively participated in nine fisheries in the Convention Area. Reported catches by 24 September 2004 included 13,307 tons of toothfish and 2,737 tons of icefish; other species were taken as bycatch. In comparison, the total reported catch of toothfish was 14,779 tons for the entire 2002/03 season (30 November 2003).

The estimate of total illegal, unregulated and unreported fishing catch during the 2003/04 season (2,477 tons) was much less than the estimate for the 2002/03 season (10,070 tons). The Catch Document Scheme (CDS) estimate for toothfish caught on the high seas during the 2003/04 season (3,746 tons) was also much less than the estimate during the 2002/03 season (11,955 tons).

Krill fishery - The total reported catch of krill in 2003/04, as reported by 24 September 2004, was 102,112 tons, including 14,979 tons made by a vessel from Vanuatu (an acceding nation), compared to 110,333 tons taken during the 2002/03 season. The catch was taken by Japan, Poland, Republic of Korea, Russian Federation, Ukraine, United Kingdom and the U.S. in Subareas 48.1, 48.2 and 48.3.

Crab and squid fisheries - Fishing for crab and squid resources in the Convention Area did not occur in the 2003/04 season and no notification had been made for the 2004/05 season.

CCAMLR Ecosystem Monitoring and Management Program - SWFSC scientist Roger Hewitt again convened the working group on ecosystem monitoring and management. During the meeting, the following groups met: workshop on plausible ecosystem models for testing approaches to krill management, advisory subgroup on protected areas, subgroup on CCAMLR Ecosystem Monitoring Program methods, ad hoc subgroup on subdividing the krill catch among small-scale management units, steering committee for the 2005 workshop on management procedures, correspondence group on predator surveys, ad hoc subgroup on data collection on board fishing vessels, and ad hoc subgroup on possible CCAMLR-sponsored activities during the International Polar Year.

The Scientific Committee noted the need to (a) establish an advisory subgroup on acoustic surveys, (b) specify plausible ecosystem models for testing management procedures, ©) hold a 2005 workshop on management procedures to evaluate options for subdividing krill catch limit among small-scale management units, and (d) hold future workshops on marine protected areas and large-scale surveys of land-based predators.

Illegal, unregulated and unreported fishing in the Convention Area - The Scientific Committee noted that estimates for catches in several areas outside the Convention Area had decreased substantially from last years estimates. It was not clear if catches had declined because stocks may have become depleted, fewer CDS reports were being received because vessels are re-flagging to states which do not participate in the CDS, or CCAMLR monitoring and compliance measures are causing a reduction in illegal, unregulated and unreported fishing

Marine debris - The Commission agreed that the Secretariat should annually produce a report of status and trends relating to all of the main aspects of marine debris-related observations. The CCAMLR marine debris database contains data from 11 sites, all within Area 48, but only four sites have data for at least three years required by the standard methods. Packaging bands continued to be reported in the debris surveys in Area 48.

Incidental mortality of marine animals during fishing operations - The assessment of incidental mortality arising from the fisheries was reviewed. In particular, the Scientific Committee noted that (a) the levels and rates of seabird bycatch in longline fisheries in the Convention Area in 2003/04 season remained low in the regulated longline fisheries but were slightly higher than the previous year in some areas, (b) there were substantial reductions in bycatch levels and rates in the French Exclusive Economic Zones in 2004, ©) estimates of potential seabird bycatch associated with illegal, unregulated and unreported longline fishing in the Convention Area were the lowest values so far estimated, and (d) levels of seabird and marine mammal bycatch in trawl fisheries in the Convention Area in 2004, notably of seabirds in the icefish fishery in Subarea 48.3 and of fur seals in krill fisheries in Area 48, were high. The Scientific Committee made recommendations to the Commission, which subsequently endorsed the requests, for revisions to conservation measures dealing with seabird mitigation measures (i.e., exemption from night-setting requirements for autoline vessels and use of seal excluder devices by the krill fishery).

New and exploratory fisheries - For the 2004/05 season, 26 notifications were made by 13 members for new or exploratory longline or trawl fisheries to fish for *Dissostichus* spp. As was the case last year, a large number of notifications for Subareas 88.1 (10 notifications for up to

21 vessels) and 88.2 (five notifications for up to 10 vessels) and Subarea 48.6 and Divisions 58.4.1, 58.4.2, and 58.4.3b (between seven and 11 vessels each). Depending on the size of the precautionary catch limits, this implied that if all vessels operated simultaneously, the available catch per vessel could be lower than that required for economic viability.

The Scientific Committee noted but could not agree on the merits of a notification for exploratory bottom trawling in Subarea 48.3 by the United Kingdom. There were concerns expressed about the adverse affects on sponge and invertebrate communities. At the Commission meeting, the United Kingdom withdrew the notification.

The Scientific Committee noted that although the total catch for Subarea 88.1 was about 67% of the catch limit, catch limits in four small-scale research units (SSRUs) were exceeded because of rapid changes in fishing patterns, the late submission of catch and effort reports, difficulties in forecasting closures in SSRUs, time lags in reporting, small catch limits in some SSRUs, and communication problems. The Scientific Committee reiterated the urgent need to develop a means for estimating abundance and providing assessments of stock status for all exploratory fisheries.

Significance of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals): As was the case in previous years, the Scientific Committee presented information that was discussed and agreed by CCAMLR for the next fishing season.

Problems: None.

Key Contact: Rennie Holt, (858) 546-5601.

Submitted by: Rennie Holt, Director, Antarctic Ecosystem Research Division.

Title of Accomplishment or Milestone: The 2004/05 AMLR field season is launched.

Current Status: Field camp was opened and equipment was shipped to Punta Arenas, Chile, to be transferred to chartered research vessel.

Background Information: The Antarctic Marine Living Resources (AMLR) Program has conducted growth, survival, reproductive, and foraging behavior studies on breeding krill predators (seals and penguins) at Livingston Island, Antarctica, during the last sixth austral summers. The field camp, Cape Shirreff, is an optimal area to study pinniped and seabirds. Additionally, the AMLR program again this season will utilize a Russian research vessel, *Yuzhmorgeologiya*, for its 2005 AMLR research. The charter begins and ends in Punta Arenas, Chile. Therefore, all AMLR scientific equipment and supplies required for the cruise and land-based research must be shipped to Punta Arenas by cargo ship.

Purpose of Activity: To open the Cape Shirreff field camp and initiate studies on seabirds and pinnipeds and to provide all required scientific equipment and supplies for the 2004/05 AMLR field season aboard the chartered research vessel.

Description of Accomplishment and Significant Results: AMLR personnel planned and procured all food and other necessary camp supplies for the field. In early November, a four-person field team (lead by Mike Goebel, SWFSC) arrived at the field camp via the National

Science Foundation research vessel *Lawrence M. Gould*. The camp was reactivated and research began immediately. All the equipment and supplies needed for the 2004/05 AMLR island and shipboard research were procured and shipped via sea to Punta Arenas, Chile. The shipment included two containers (owned by the cargo shipping line), which were fully loaded with equipment and supplies. Because of the complexity of the field research to be accomplished, as well as the vast quantity of equipment and supplies in this shipment, much time and effort was necessary for careful planning, procurement, and inventory.

Significance of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals): Studies at Cape Shirreff constitute a significant part of the AMLR program's land-based research effort. During the AMLR field season, researchers collect scientific data mandated by the AMLR Convention Act of 1984. The act is a result of the U.S. membership in the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). This research effort directly supports the U.S. participation in the CCAMLR Ecosystem Monitoring Program (CEMP). CCAMLR is an international treaty that seeks to manage and conserve living resources in the oceans surrounding Antarctica. The Act established the AMLR program within the NMFS in order to support CCAMLR goals. CEMP has identified specific datasets associated with land-based predators that should be collected by treaty participants; the AMLR program will follow this directive during the upcoming field season at Cape Shirreff. The shipment of AMLR equipment and supplies to Chile is critical to the success of the 2004/05 AMLR island and shipboard research.

Problems: None.

Key Contact: Jessica Lipsky, (858) 546-5600.

Publications

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LA JOLLA LABORATORY) FISHERIES RESOURCES DIVISION

Submitted by: Roger Hewitt, Director, Fisheries Resources Division.

Title of Accomplishment or Milestone: 55th annual CalCOFI Conference and Trinational Sardine Forum.

Current Status: Completed within budget.

Background Information: The California Cooperative Oceanic Fisheries Investigations (CalCOFI) is a partnership between the SWFSC, California Department of Fish and Game, and Scripps Institution of Oceanography. The organization was formed in 1949 to investigate the rapid decline of Pacific sardine off California but now addresses a much broader range of scientific questions about the California Current ecosystem and the management of its living resources. On a rotating basis, one of the three institutions hosts an annual conference, selects the conference symposium topic, publishes data reports and a scientific journal, and maintains a publicly accessible data server (www.calcofi.org).

In May 2000, a three-day sardine symposium was held in La Jolla, California, to address the lack of information regarding Pacific sardine abundance, movement, and fishery activity. The participants recommended the formation of a Trinational Sardine Forum to implement and coordinate coast-wide collection of the data for sardine stock assessment, to exchange information, and keep abreast of trends in the fishery. The forum has since met annually and is attended by industry, fishery agency and academic scientists from Canada, Mexico and the U.S.

Purpose of Activity: As this year's conference host, the Fisheries Resources Division chose "Pacific Sardine: Past, Present, and Future" to be the symposium. With this topic, we decided to hold the CalCOFI conference in conjunction with the Trinational Sardine Forum for the first time, to ensure the broadest participation and exchange of information. New sardine research programs have been implemented from Mexico to Canada, and modern technologies and statistical methods are being applied using both new and old sardine data. The goals of this joint CalCOFI-Trinational Sardine Forum were to present results from the latest research and, at least for this year, bring the CalCOFI conference back to its roots.

Description of Accomplishment and Significant Results: The conference was very well-attended compared with previous years, with 110 scientists from the U.S., Canada, Mexico, Japan, and Germany participating. Fifteen sardine symposium talks were presented, as well as 15 contributed talks on a variety of California Current topics. A separate poster session was held to highlight the 19 poster submissions and provide ample time for discussion with the authors. Trinational Sardine Forum working group meetings were held on the final day of the conference, with 50 researchers and members of industry in attendance.

In addition to the scheduled talks and working group meetings, an evening data management workshop was chaired by Karen Stocks (San Diego Supercomputer Center) and Karen Baker (Scripps). Approximately 25 people met to discuss the development of a contemporary information management framework for CalCOFI and how the work could contribute to PaCOOS planning.

Significance of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals): This is the first time that the CalCOFI Conference and the Trinational Sardine Forum have been merged together. This new format allowed representatives from country, state, and

regulatory agencies, the fishing industry, and academia to share their viewpoints in an open forum, and we have received very positive feedback from the participants.

Problems: None.

Key Contact: Anne Allen, (858) 546-7128.

Submitted by: Gary Sakagawa, Assistant Center Director for Fishery Management Programs; Roger Hewitt, Director, Fisheries Resources Division.

Title of Accomplishment or Milestone: 19th North Pacific Albacore Workshop (NPAW).

Current Status: Task completed on schedule.

Background Information: The NPAW was established in 1974 for the purpose of promoting and accelerating joint research on North Pacific albacore among interested parties. It sponsors regular meetings for researchers to report on research activities, exchange data, coordinate large-scale research projects and conduct stock assessments. At the18th meeting in 2002, the participants agreed to accelerate research towards performing a significant stock assessment at the workshop in 2004. The 19th meeting was held in Nanaimo, British Columbia, Canada, from 25 November to 2 December 2004 and was hosted by the Pacific Biological Station of the Canada Department of Fisheries and Oceans.

Purpose of Activity: The SWFSC is a principal party to the NPAW agreement and participates in planning and execution of workshop projects and meetings. Because the albacore fisheries have recently produced a high level of catch and many more boats are involved than before, the stock is thought to be heavily fished. Planning for the 19th NPAW was with the objective to determine to what extent the stock is being fished and whether the stock is capable to sustaining the high level of catch in the future.

Description of Accomplishment and Significant Results: Participants from research organizations in Canada, Japan, Mexico, Taiwan, and the U.S., the Inter-American Tropical Tuna Commission, and Secretariat of the Pacific Community met from 25 November through 2 December 2004. They reviewed fishery developments, results from research assignments, available data and stock assessment models appropriate for the available data. The stock assessment model of choice was the VPA model and executed with the VPA-2BOX software. Participants reviewed data and information for input parameters for this model, made choices for input values, reviewed results of model runs and made adjustments to model variables. Several iterations of this process were conducted. Final results indicated that the stock is being heavily exploited with current (2003) *F* at about 0.43. All estimates of biomass parameters are currently high and well above levels for the late 1980s when biomass was low and the fisheries collapsed. Stock biomass projections indicate that with high recruitment to the stock, similar to levels observed in recent years (1999-2003), the current catch is sustainable. If recruitment retreats to the lower level observed in 1975-1989, the current catch is not sustainable.

Significance of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals): The workshop met its objective of performing a significant stock assessment with available data up to 2004. The workshop results also provide a basis for framing management advice.

Problems: None.

Key Contact: Gary Sakagawa, (858) 546-7177.

Submitted by: Roger Hewitt, Director, Fisheries Resources Division.

Title of Accomplishment or Milestone: NOAA ocean explorations: Large pelagic sharks of the eastern tropical Pacific.

Current Status: The cruise was completed on 14 October 2004, and analysis of the data collected is ongoing.

Background Information: Despite an increasing dependency of Pacific Rim countries on shark fisheries, we know very little about pelagic sharks and the tropical ecosystems that support them. The recently documented collapse of shark populations in the North Atlantic, despite a fisheries management plan for sharks in place there since 1993, makes it imperative that we learn more about these predators and their associations in the Pacific.

Apex predators of the eastern tropical Pacific (ETP) have long been of national and international diplomatic interest due to the directed harvest of tunas and billfishes and the incidental take of marine mammals, seabirds, and turtles. Although ETP fisheries occur outside U.S. waters, U.S. fishers are bound by the provisions of the Marine Mammal Protection Act and by the provisions of the Inter-American Tropical Tuna Commission. NOAA Fisheries has expended enormous personnel resources and ship time in efforts to study the ecosystem of the ETP and the interactions of marine mammals and tunas. However, almost nothing is known about the biology of large pelagic sharks and their role as a third group of apex predators in the ETP.

Purpose of Activity: The objectives of the cruise were to investigate the role of pelagic sharks as apex predators of the ETP: their species composition, life-history, movement patterns, food habits, physical environment and biotic environment. This was accomplished primarily by catch-and-release longline sampling, and through electronic tagging studies to determine diel vertical movements and long-term horizontal movement patterns. Additional objectives were to correlate the movement patterns of the sharks with regard to large-scale oceanographic and bathymetric features, and to obtain and archive DNA and tissue samples.

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Description of Accomplishment and Significant Results: The ETP shark cruise aboard the NOAA ship *David Starr Jordan* returned to port after covering 4,100 miles. A total of 27 sharks of five species (silky, mako, blue, pelagic thresher, and ocean white-tip) were captured by longline during 18,214 hook hours. Nine sharks total were tagged with electronic tags: three sharks were equipped with pop-off archival tags, two were equipped with smart position and temperature transmitting tags, and four sharks were fitted with both tag types. Of the nine tagged sharks, eight successfully transmitted data to the Argos satellites, and as of December 27, three are still active (Fig. 1). Off the exclusive economic zone of Baja California there was a faunal shift from silky, ocean white-tip and pelagic thresher sharks to mako and blue sharks at the transition zone between the tropics and the warm temperate zone.

In addition to the tagging work, 17 sharks were injected with oxytetracycline for ageing studies. Thirty-eight DNA samples were collected from sharks, billfish, tuna, and dorado. The dorado DNA samples were sent to colleagues in Mexico. Several Clipperton groupers and a pelagic thresher shark were brought back for colleagues at Scripps Institution of Oceanography and other samples were donated to their fish collection. Live fish were collected for the Stephen Birch Aquarium, and shark tissue samples were collected for the frozen zoo at the Center for the Reproduction of Endangered Species.

Significance of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals): In other regions oceanic white-tip shark populations have declined precipitously. The low encounter rates during this survey indicate that the same may be true in the ETP. Further surveys should be conducted in order to monitor these resources before it's too late. This is the first study in the ETP to deploy fin-mounted tags on ocean white-tip sharks, and we hope to gain vital information on their behaviors and migration patterns in this region over the coming months (Fig. 2a, b).

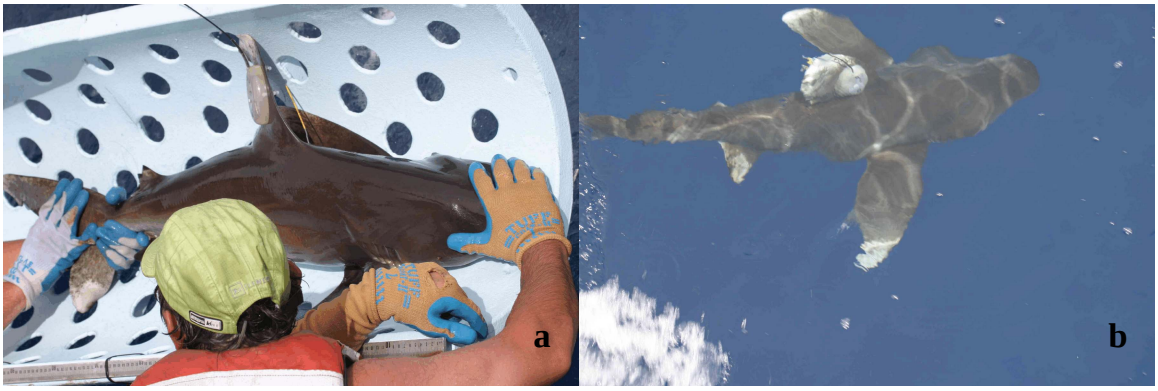

Figure 2. (a) An oceanic white-tip shark being fitted with a SPOT tag by SWFSC researchers. (b) The same shark successfully released with the fin-mounted tag clearly visible.

Problems: None.

Key Contact: Russ Vetter, (858) 546-7125.

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LA JOLLA LABORATORY) PROTECTED RESOURCES DIVISION

Submitted by: Stephen B. Reilly, Director, Protected Resources Division.

Title of Accomplishment or Milestone: Marine mammal stock assessment reports.

Current Status: The 2005 marine mammal stock assessment reports will be presented to the Pacific Scientific Review Group in January 2005. Revised stocks include harbor seals (California stock), short-finned pilot whales (California/Oregon/Washington stock), false killer whales (Hawaiian stock) and humpback whales (eastern North Pacific stock). Additionally, substantial updates are being presented on blue whale population studies, California common dolphin stock structure, Hawaiian bottlenose dolphin stock structure, Hawaiian dolphin surveys, California harbor seal survey, and estimated mortality and injury of marine mammals in Pacific gillnet and longline fisheries.

Background Information and Purpose of Activity: Pursuant to the 1994 amendments to the Marine Mammal Protection Act, the NMFS is required to publish stock assessment reports for all stocks of marine mammals within U.S. waters, to review new information every year for strategic stocks and every three years for non-strategic stocks, and to update the stock assessment reports when significant new information becomes available. The Pacific Region, which encompasses the U.S. Exclusive Economic Zone (EEZ) waters adjacent to Washington, Oregon, California, and Hawaii, includes marine mammal stocks studied by the Southwest Fisheries Science Center (SWFSC, La Jolla, California), the Pacific Islands Fisheries Science Center (PIFSC, Honolulu, Hawaii) and the National Marine Mammal Laboratory (NMML, Seattle, Washington) and individual reports are revised separately by personnel at those NMFS laboratories.

Stock assessment reports (SARs) contain information regarding the distribution and abundance of marine mammal stocks, population growth rates and trends, estimates of annual human-caused mortality from all sources, descriptions of the fisheries with which the stocks interact, and the status of the stocks. SARs are used by the Pacific Scientific Review Group (PSRG) who advise the NMFS on uncertainties and research needed to (1) determine status of marine mammal stocks, (2) identify modifications in fishing gear and practices likely to reduce incidental mortality and serious injury to marine mammals in commercial fishing operations, (3) review the actual, expected or potential impacts of habitat destruction, including marine pollution and natural environmental change on specific marine mammal species, and (4) advise on appropriate conservation or management measures to alleviate any such impacts. SARs are also used by the NMFS and take reduction teams to develop and implement take reduction plans as required under the Marine Mammal Protection Act to reduce incidental mortality or serious injury of marine mammals occurring during the course of commercial fishing operations to insignificant levels.

Description of Accomplishment and Significant Results: Results of population structure analyses pertinent to status of stock reviews will be presented to the PSRG at a meeting to be held in January 2005 in Santa Cruz, California. For the 2005 SARs, all stocks are being reviewed and those for which new and significant information is found will be revised. Stocks being revised by SWFSC include: harbor seals (California stock), short-finned pilot whales (California/Oregon/Washington stock), false killer whales (Hawaiian stock) and humpback whales (eastern North Pacific stock). Additionally, research results will be presented to the PSRG on blue whale population studies, California common dolphin stock structure, Hawaiian

bottlenose dolphin stock structure, Hawaiian dolphin surveys, California harbor seal survey, and estimated mortality and injury of marine mammals in Pacific gillnet and longline fisheries.

The Pacific harbor seal 2005 SAR (*Phoca vitulina richardii*; California stock) was revised to provide an updated count of harbor seals for California. These updated counts are based on an aerial photographic survey conducted by SWFSC in May-July of 2004, to document the number of seals hauled out during the molt period (Lowry *et al.* 2004). The state of California was divided into three sections to compensate for latitudinal differences in the timing of the molt and each section was surveyed on different dates. The three sections were: (1) Channel Islands and mainland coast of southern California from the U.S.-Mexico border to Pismo Beach, (2) central California from Pismo Beach to Point Reyes and San Francisco Bay estuary, and (3) northern California from Point Reyes to the California/Oregon border. In addition to providing a total count of harbor seals for California, counts were stratified by 0.5 degrees latitude for coastal mainland sites, for each of the Channel Islands, and for sections of California. The population of harbor seals in the state of California appears to be increasing, but the rate of increase appears to be lower than it was in the 1980s and 1990s.

The 2005 SARs for false killer whales (*Pseudorca crassidens*; Hawaiian stock) was revised to include updated estimates of fishery mortality and injury, as this species is incidentally taken in the pelagic longline fishery of the central North Pacific Ocean. In spite of these revisions, information is lacking about the distribution, abundance and population structure of animals inhabiting the central North Pacific Ocean outside the Hawaiian EEZ to more appropriately assess the impact of the fishery. The only recognized stock for false killer whales in the region is the U.S. EEZ of the Hawaiian Archipelago. The best available data for this management unit resulted in a 'strategic' designation (*i.e.*, more animals are incidentally killed in the fishery than the population can sustain) for false killer whales as defined by the U.S. Marine Mammal Protection Act (Carretta *et al*. 2002). To help improve our understanding of population structure, mitochondrial DNA (mtDNA) control region sequences were analyzed from animals sampled around Hawaii and in the eastern tropical Pacific for false killer whales and short-finned pilot whales (Chivers 2004).

The humpback whale 2005 SAR (*Megaptera novaeangliae*; **e**astern North Pacific stock) was revised to provide updated abundance and mortality information based on research conducted by Cascadia Research in 2003. Principal support for this research was from Southwest Fisheries Science Center to assess population size and trends as well as reproductive and mortality rates. Calambokidis *et al*. (2004) estimated humpback whale abundance in feeding areas from 1991 to 2003 using Petersen mark-recapture estimates based on photo-identification collections in adjacent pairs of years. These data show a general upward trend in abundance followed by a large drop in the 1999/2000 and 2000/2001 estimates. The 2002/2003 population estimate (1,391, CV=0.22) is higher than any previous estimate by about 400 animals (Calambokidis *et al*. 2004). The current high estimates appear to be the result of an influx of whales into the region that had not been seen in previous years (Calambokidis *et al*. 2004)

Significance of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals): The identification of stocks for management is the subject of ongoing research at the SWFSC because little is known about stock or population structure for many species impacted by fisheries. Thorough updated and revised assessments of abundance,

mortality, distribution, and stock structure are essential to the accuracy and usefulness of SARs for the management of stocks.

Key Contact: Jim Carretta, (858) 546-7171.

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Submitted by: Stephen B. Reilly, Director, Protected Resources Division.

Title of Accomplishment or Milestone: SPLASH ship survey of North Pacific humpback whales.

Current Status: The SPLASH cruise departed the Pacific Marine Center of Seattle, Washington, on 28 June 2004 and completed a four-month ship survey to assess the status of humpback whales throughout the North Pacific on 3 November 2004.

Background and Purpose of Activity: Humpback whale populations were depleted due to commercial exploitation and remain listed as endangered today. The most complete recent estimate of North Pacific humpback whale abundance was conducted using mark-recaptures of individual whales photo-identified between 1990 and 1993 (Calambokidis *et al.* 1997, 2001). Data from photo-identification and genetics studies have provided some information on North Pacific stock structure, verifying a high degree of site fidelity to feeding areas and some intermixing in the wintering areas. However, only limited data exist on the numbers, sizes, and potential boundaries of most feeding areas in the North Pacific (Calambokidis *et al.*, 2001). Given the limitations of past studies, a need exists for more accurate information. SPLASH proposes to conduct the first-ever comprehensive field study of humpback whales throughout the North Pacific. This research program will use consistent sampling effort in all known feeding and wintering areas. Large areas of the North Pacific that have not been systematically and comprehensively sampled will be surveyed using methods employed in other areas. Though much valuable information has been learned about humpback whales in the North Pacific from previous research efforts, this integrated design should lead to a new understanding of the biology of humpback whales that is unobtainable from retrospective analysis of existing data.

Description of Accomplishment and Significant Results: SPLASH was a collaborative project involving the governments of Canada and Mexico as well as multiple agencies within the U.S. government. The primary study methods included photo-identification and biopsy sampling. Passive acoustics (a towed hydrophone array and sonobuoys) were used to aid in finding aggregations of humpback whales. In addition, biological and oceanographic data were collected to better characterize the whale's environment, and survey data were collected on all other cetacean and pinniped species that are observed. Biopsy samples were also collected from other cetacean species in areas where they have been poorly sampled in the past. The survey followed predetermined tracklines, however, tracklines were modified based on real-time information about humpback whale distribution (from the cruise and from other sources) and

weather.

The cruise was highly successful in locating and collecting data on humpback whales; with 507 biopsy samples and 917 catalog-quality fluke shots collected. These photo identification collections ensure that a thorough catalog of North Pacific humpback whale flukes will result from SPLASH. In addition to this success with the target species, there were observations of two rare large whale populations, blue and right whales. Blue whales of the western Pacific stock were sighted south of the central Aleutian Islands and further to the west just outside Russian waters. These are the first sightings of western Pacific blue whales in U.S. waters in decades. The SWFSC conducted a vessel survey south of the Aleutian Islands in 1994 and failed to detect any blue whales. Kate Stafford of the National Marine Mammal Laboratory, who is currently sailing on the SPLASH cruise, has been recording blue whales in this region for about 10 or more years and has been able to acoustically differentiate the western and eastern Pacific stocks. Sonobuoy recordings of the recent sightings confirmed that these animals belong to the western Pacific stock of blue whales. Identification photographs and biopsies were also obtained from the whales. An additional significant event on the cruise was the sighting, acoustic recording, and photo-identification of northern right whales. This population is thought to be near extinct, and until an observation in 2002, it was questioned if they were still reproducing. Therefore, encountering at least 20 right whales, including three calves (the number of individuals is currently being determined based on photo-identification and biopsies), was a welcomed surprise. Furthermore, 426 killer whale ID photos were obtained and cataloged throughout the cruise and are being compared to catalogs of resident whales photographed in southeast Alaska, the eastern Aleutians, and the Gulf of Alaska. See tables below for a summary of biopsies and photo-identification collected on SPLASH.

Species	Biopsies
Humpback whale	507
Fin whale	64
Northern right whale	22
Blue whale	4
Sperm whale	8
Killer whale	42
Baird's beaked whale	6
Dall's porpoise	2
Cuvier's beaked whale*	1
Grand total	**656**

*dead when sampled

Species	Photo-ID
Humpback whale	917
Fin whale dorsal	108
Northern right whale	23
Sperm whale fluke	16
Blue whale dorsal	5
Minke whale dorsal	1
Killer whale dorsal	426
Baird's beaked whales	21
Northern right whale dolphins*	1
Pacific white-sided dolphins*	3
Cuvier's beaked whale (dead)	1
Steller sea lion	1
Grand total	**1523**

*number of groups photographed

Significance of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals): This four-month ship survey was an essential component of multi-agency and multi-national program to assess the status of humpback whales throughout the North Pacific. SPLASH successes exceeded expectations with 507 biopsy samples and 917 catalog-quality fluke shots collected from humpback whales. Additionally, blue whales were sighted for the first time in this area in decades. Along with these blue whale sightings, four biopsy samples, five dorsal photo-identifications, and acoustic recordings were collected.

Biopsies, photo-identifications and acoustic recordings were collected from the largest group of northern right whales observed in the last century. At least three calves were sighted in this group, whereas up until 2002, it was questionable if these whales were still reproducing.

Key Contact: Jay Barlow, (858) 546-7178.

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Submitted by: Stephen B. Reilly, Director, Protected Resources Division.

Title of Accomplishment or Milestone: Design of ecosystem studies data management system.

Current Status: The Ecosystem Studies Program of the SWFSC's Protected Resources Division (PRD) completed the design of a new data management system. The system will ensure that all datasets collected by this program are properly edited, processed, documented, stored, and maintained. The system will apply to all past and future datasets.

Background Information and Purpose of Activity: Data collection and maintenance is a primary function of the Southwest Fisheries Science Center. The PRD's Ecosystem Studies Program has been collecting data on ecosystem attributes (physical and biological oceanographic conditions, abundance and distribution of mid and top-trophic level species) in a number of geographical areas, which have been regularly surveyed for over two decades. This rare, long-term time series of species and environmental data provides a foundation for resolving critical information gaps about species distributions and ecology, addressing scientific and management priorities as identified by the Marine Mammal Protection Act and Endangered Species Act and for making management decisions in a timely manner.

Addressing the PRD's mandates depends, in part, on integrating the various data sets collected by the Ecosystem Studies Program. To date, the program does not have a single person dedicated to data management, thus, these responsibilities are falling on field and laboratory scientists whose expertise lies in data collection and analysis and who are fully committed to projects requiring these skills. As the Ecosystem Studies Program continues to collect data on a yearly basis, the number of data sets invariably increases, and this piecemeal approach to data management is becoming a hindrance to effective use of the data.

Description of Accomplishment and Significant Results: The Ecosystem Studies Program has designed a data management system (DMS) to establish and maintain clean, updated, and well documented copies of all ecosystem studies data sets and facilitate integration among different data sets. The implementation of the DMS is a long-term project that will occur in

multiple phases. The different components of this project include five basic steps:

1. *Data management in the field*: As data are collected, they will be cleaned using data edit programs. Documentation of field collection methods, data format, data codes, and data processing steps (where applicable) will also be completed in the field.

2. *Data management in the lab*: Once data collection has been completed, final cleaning using data edit programs will occur (for applicable data sets) in the laboratory. Following this cleaning, the data will be processed using appropriate programs. Documentation of final data cleaning steps and processing methods will be completed at this time. The result will be final cleaned and processed data files, which will be passed to the data manager (see step 3) and documented in a NOAA Technical Memorandum. This document will be published on a cruise-specific basis and will contain a complete inventory of all data sets, documentation of field collection methods and data processing procedures, and the final location of data.

3. *The data manager*: Final data files and documentation will reside with the data manager and data manager technician. Their responsibilities include: (a) storage of data files and oversight of proper backup procedures, (b) oversight of data format on a per-data set basis to ensure consistency between years, ©) creation and maintenance of ACCESS data bases from clean ASCII files, (d) creation and maintenance of GIS data bases, (e) filling of data requests, (f) further editing of any data set as required, and (g) alerting all users when data have been updated.

4. *The metadata document*: This single ACCESS file will contain a complete listing of metadata for all Ecosystem Studies Program data sets. The file will consist of three levels. Level 1 will contain information specific to each PRD research vessel cruise: cruise name, years conducted, ships used, cruise numbers, chief scientist as point of contact, start and end dates, number of sea days, number of legs, latitude and longitude boundaries, and general geographic study area. Level 2 will contain a complete listing of all data collected on a per-cruise basis. For each data set, the following will be listed: technical memorandum citation, contact person, number of samples, location of ASCII data files, processing status and details. Level 3 will contain specific data format and data code details for each data set. The metadata document will be an evolving document, changing as additional data are collected and previously collected data are processed and analyzed. The data manager and technician will maintain this document.

5. *Cleaning and documenting previously collected data*: Because there has been no dedicated effort to design a data management system prior to this time, previously collected data are in various states. This step will ensure that all previously collected data are properly cleaned, processed, documented, and stored.

Now that the DMS has been designed, Ecosystem Studies Program members are working on transferring data into the system. A large part of the work involves cleaning and documenting past data sets (step 5). This effort is likely to take several years. Beginning with PRD research vessel cruises in 2005, we hope to incorporate as many Ecosystem Studies Program data sets into the entire system (steps 1-4) as possible.

A critical issue involves the lack of a technician for the data manager. Several proposals for financial support to hire a qualified person for this position have been submitted and their outcome is pending. The technician will provide the major effort in transferring clean ASCII files

to ACCESS, and to GIS format. These final steps will greatly facilitate use of data and integration between multiple data sets.

Significance of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals): The DMS designed by the Ecosystem Studies Program will enable efficient data access, facilitate data integration, and ensure adequate data back-up and documentation. All of these steps are necessary to successfully address the PRD's mandates.

Key Contact: Lisa T. Ballance, (858) 546-7173.

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SANTA CRUZ LABORATORY

Submitted by: Churchill Grimes, Director, Santa Cruz Laboratory; Susan Sogard, Chief, Ecology Branch.

Title of Accomplishment or Milestone: Mark and recapture studies of juvenile steelhead.

Current Status: Sampling for a two-year study on Soquel Creek, central California coast, has been completed. Data analysis is currently underway.

Background Information: Steelhead exhibit a remarkable plasticity of life history trajectories, with substantial variability in timing of juvenile smoltification and emigration to the ocean, timing of maturation, and timing of adult return. Growth rates are thought to play a dominant role in determining which of multiple life history trajectories is selected by an individual fish. However, basic information on abundance, growth rates, and survival of age-0 steelhead in natural populations is generally lacking, particularly for watersheds along the central California coast. Growth rate data also provide valuable indices of the inherent productivity of a particular ecosystem for a specific species.

Purpose of Activity: The goals in this study are to measure growth rates of wild steelhead juveniles over several seasons, to estimate site fidelity of individuals, and to estimate densities of different age classes of steelhead. All sampling is conducted on Soquel Creek, within the Soquel Demonstration State Forest, in an effort to measure these processes in a relatively pristine nursery habitat. Fish are initially sampled in June using depletion electrofishing to provide an estimate of density. All captured fish are tagged with either a size-specific elastomer mark (fish < 70 mm fork length) or an individual-specific PIT tag (fish > 70 mm). Electrofishing is repeated in October and December to assess growth of recaptured tagged fish and declines in abundance over time.

Description of Accomplishment and Significant Results: The researchers have now completed two full years of sampling at five sites. Consistent results across the two years suggest that steelhead growth is stage-dependent with younger fish growing at faster rates, density-dependent with high densities inhibiting growth, and remarkably low during the summer and fall seasons. Thus, winter appears to be the season of growth opportunity for young steelhead. Survival, in contrast, appears to be high in summer and low in winter.

Significance of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals): These results provide new information on central coast steelhead populations and will be valuable in developing efforts to promote and monitor recovery of salmon populations listed under the Endangered Species Act.

Problems: None.

Key Contact: Susan Sogard, (831) 420-3932.

Submitted by: Churchill B. Grimes, Director, Santa Cruz Laboratory.

Title of Accomplishment or Milestone: Green sturgeon status review update.

Current Status: Draft available.

Background Information: The NMFS Southwest and Northwest Regions requested an update of the status review for North American green sturgeon (*Acipenser medirostris*). The request came as the result of a lawsuit requiring NMFS to consider "significant portion of the species' range" issues in relation to green sturgeon. The Biological Review Team (BRT) was also requested to consider any new scientific or commercial information available since the last status review and to identify the sources, severity and geographic scope of threats to green sturgeon.

Purpose of Activity: The green sturgeon status review update provides scientific advice to the NMS Southwest and Northwest Regions for their consideration in making Endangered Species Act (ESA) listing decisions for this species.

Description of Accomplishment and Significant Results: The BRT considered both the green sturgeon distinct population segment (DPS) structure from the previous status review and new genetic analyses, and concluded that the new information further supported their previous conclusion that there are at least a northern DPS including the Rogue, Klamath, and Eel river populations and a southern DPS with only a single population in the Sacramento River. The BRT concluded that in the northern DPS, the inclusion of two significant spawning rivers, the Rogue and the Klamath, the continued reduction in green sturgeon catch, and the improvement in data from the Rogue River were encouraging information. The BRT concluded that in the southern DPS, green sturgeon faced considerable greater risk of extinction than in the north. The BRT felt that the blockage of green sturgeon spawning from what were certainly their historic spawning areas above Shasta Dam and new information about the decrease in spawning area in the Feather River spawning area after the construction of Oroville Dam along with the large number of potential threats placed green sturgeon at substantial risk in this DPS.

Significance of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals): Scientifically sound and complete population assessment is the critical element in ESA determinations. The authority of ESA decisions relies on the credibility of these assessments.

Problems: Insufficient time scheduled.

Key Contact: Peter Adams, (831) 420-3923.

Submitted by: Churchill B. Grimes, Director, Santa Cruz Laboratory.

Title of Accomplishment or Milestone: Recovery Science Review Panel (RSRP) meeting.

Current Status: Meeting held 1-3 December 2004 at Santa Cruz, California. The RSRP is currently writing their report.

Background Information: The RSRP consists of six independent, highly qualified scientists who provide review and oversight for NMFS's salmon recovery process. Panel members include Dr. Joseph Travis (chair), Florida State University; Dr. Russell Lande, University of California San Diego: Dr. Marc Mangel, University of California Santa Cruz; Dr. Charles Peterson, University of North Carolina Chapel Hill; Dr. Mary Power, University of California

Berkeley; Dr. Daniel Simberloff, University of Tennessee; and Dr. Ransom Myers, Dalhousie University.

Purpose of Activity: This purpose of the meeting was to review scientific advice provided by the NMFS Southwest and Northwest Fisheries Science Centers on the impact of resident and anadromous *Oncorhynchus mykiss* life history forms on ESA listing policy.

Description of Accomplishment and Significant Results: The RSRP reviewed the science centers' advice on how resident and anadromous forms of *O. mykiss* contribute to long-term evolutionarily significant unit (ESU) viability. The advice centers on how residents contribute to ESU viability, what would be the consequences of loss of anadromy, and if anadromy were lost, what would be the future characteristics of the ESU. A number of presentations gave an overview of the resident and anadromous issues, genetics, and summaries of ongoing studies in California, the Columbia River, and Alaska. The science centers provided their view that a resident fish only ESU would be fundamentally changed due to the loss of connectivity between the populations. This would constitute a significant loss of diversity as well as a loss of "a significant portion of the species' range."

Significance of Accomplishment (e.g., to the Center, to Management, and to NMFS Strategic Plan Goals): The RSRP reports provide outside perspectives on NMFS' ESA salmon recovery scientific advice and policy. The reports ensure that recovery efforts are based on well accepted ecological and evolutionary principles and promote credibility that NMFS is using "best science" in its recovery efforts.

Problems: None.

Key Contact: Peter Adams, (831) 420-3923.

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